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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,180	08/29/2001	John T. Moore	MI22-1776	8591

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EXAMINER	
ROCCHEGIANI, RENZO	
ART UNIT	PAPER NUMBER
2825	

DATE MAILED: 10/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/943,180	Applicant(s) MOORE ET AL.	
	Examiner Renzo N. Rocchegiani	Art Unit 2825	A-W

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 July 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20 and 40-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20 and 40-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *13* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-20 and 40-61 are rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 5,731,235 (Srinivasan et al.) in view of European Patent No. 886308 A2 (Kobayashi et al.).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned

by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Srinivasan et al. discloses a process to form a capacitor wherein a first electrode (item 42, Fig. 9) is formed over a substrate (item 32, Fig. 9), wherein a dielectric region (items 62, 46, 47, 52 and 60, Fig. 9) is formed over the first electrode and wherein a second electrode (item 54, Fig. 9) is formed over the dielectric region. The dielectric region comprises a first oxide layer (item 62, Fig. 9) over the first electrode, a silicon nitride layer (item 46, Fig. 9) over the oxide layer, wherein the nitride layer comprises pin holes (item 47, Fig. 9), a silicon comprising layer (item 50, Fig. 6, see also item 20, Fig. 3 and col. 3,lines 37-47) is deposited over the silicon nitride, the silicon comprising layer is then nitridized to form a second silicon nitride layer (item 52, Fig. 9) without affecting the silicon comprising material inside the pin holes, finally an additional silicon oxide layer (item 60, Fig. 9) is deposited over the nitridized silicon comprising layer. Srinivasan et al. also disclose depositing the first silicon nitride layer at a temperature of 400 degree C or above (col. 3, lines 18-24).

Srinivasan et al. do not specify the use of a silicon dioxide for the silicon comprising layer and do not disclose the use of a plasma for the nitridation process. Srinivasan et al. further do not specify the spacing between the substrate and the electrode in the plasma chamber. Yet, Srinivasan et al disclose that other materials known in the art may be applied for their invention (see col. 4, lines 48-55). Furthermore Srinivasan et al. discloses that silicon dioxide is not only a well known and typically preferred material in the formation of capacitor dielectric layers (see col. 1,

lines 20-31) but it also is a good material to cure the pin holes in silicon nitride which is the problem they are addressing. (see col. 1, lines 43-49).

Kobayashi et al. teach the nitridation of silicon dioxide using a plasma. (See abstract).

It would have been obvious to one having ordinary skill in the specific art to combine the teachings of Srinivasan et al. to those of Kobayashi et al., and thus arrive at the claimed invention, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 SUPQ 416. Furthermore, it would have been obvious to use plasma nitridation since as taught by Kobayashi et al., using a plasma will resolve a number of problems encountered in high thermal nitridation and since plasma nitridation of silicon dioxide will result in a modified oxide layer, i.e. the formation of silicon nitride. (See Kobayashi et al., col. 2 and col. 8). Finally, because it is well known in the specific art that the spacing between the plasma electrode and the substrate would affect the manipulation of the other variable such as power and pressure during the plasma process, such spacing is a result effective variable and thus discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Response to Arguments

3. Applicant's arguments filed on July 28, 2003 have been fully considered but they are not persuasive. Applicant argues that the amendment to the claims render the pending application patentable. The examiner disagrees. Applicant argues that the

newly amended claim 1 and newly added claims are patentable over the prior art because they recite the new limitation that specifies the distance between the target substrate and the plasma electrode. The examiner disagrees because as stated above, it is well known in the art that such distance is a result effective variable and thus arriving the optimal range would be obvious in light of the prior art. Applicant further argues that claim 5, together with the other claims that have similar limitations, is patentable over the prior art because: first the reference Kobayashi only teaches nitridizing the surface of the silicon oxide, second the reference to Srinivasan discloses elemental silicon as opposed to silicon oxide, and third the reference teaches nitridizing the whole layer without leaving the material in the pin holes unchanged. The examiner disagrees on all three points. First, while the Kobayashi reference teaches that the nitridization occurs in the surface of a silicon oxide, it is for an 8 nm thick silicon oxide. As shown in Fig. 6 of the Kobayashi reference, the process results in the nitrogen diffusing to a depth of about 6 nm. In Srinivasan the silicon layer is not 8 nm thick, instead it is only 5 nm thick. Thus, when combined with Srinivasan, the process would nitridize the whole layer above the initially deposited nitride. Second, the differentiation the applicant makes between elemental silicon and silicon dioxide and the fact that one is semiconductive while the other is a dielectric is not well taken. Srinivasan discloses a silicon layer, but also specifically states that such layer is a dielectric layer (see col. 6, lines 45-55). Also, Srinivasan clearly states that the silicon material may be replaced with any other suitable material. Furthermore, in the background section, Srinivasan discloses that silicon dioxide is a very good material to use in plugging the pin holes in

silicon nitride. Plugging the pin holes in the silicon nitride is the sole function of the silicon layer in the invention of Srinivasan. Thus, because of the disclosure in the background section and the motivation provided in the description of the specification, the examiner determined that one with general skill in the art would know of the substitution and be motivated to make such substitution with an expectation of success. Thus, replacing the silicon material with silicon oxide would be obvious. Third, applicant argues that Srinivasan nitridizes the material in the pin holes. The examiner again disagrees. Based on the figures in Srinivasan, it seems clear that the only portion of the layer that is nitridized is the one indicated as item 50, so as to form what is referred to as item 52. Items 47, are separated from item 50 and there is no disclosure or suggestion that such portions would also be nitridized. Based on the above arguments the examiner has decided to maintain the rejection presented above. The above rejection has been modified to include the newly added limitations and claims. Because the amendment necessitated such changes in the rejection the examiner has decided to make this action final.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renzo Rocchegiani whose telephone number is (703) 308-5839. The examiner can normally be reached on Monday through Friday from 8:30 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached at (703) 308-1323. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

RNR

October 6, 2003

MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
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